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(54) FUEL CELL STACK

(57)Abstract:

PROBLEM TO BE SOLVED: To efficiently perverse leak of fuel gas, etc., certainly corresponding to expansion and contraction of a fuel cell stack in a stacking direction loading the fuel cell stack in vehicles, etc.

SOLUTION: A mounting structure 30 comprises a first and second end plates 16, 24 disposed in both ends in the stacking direction of a first fuel cell stack 12. The first end plate 16 is provided with a movable support means 158b for movably maintaining the first end plate 16 for an attachment plate 31 of vehicles into the stacking direction through a rubber mount 18. The second end plate 24 is provided with a fixed supporting means 158a for maintaining the second end plate 24 to the attachment plate 31 through the robber mount 168.

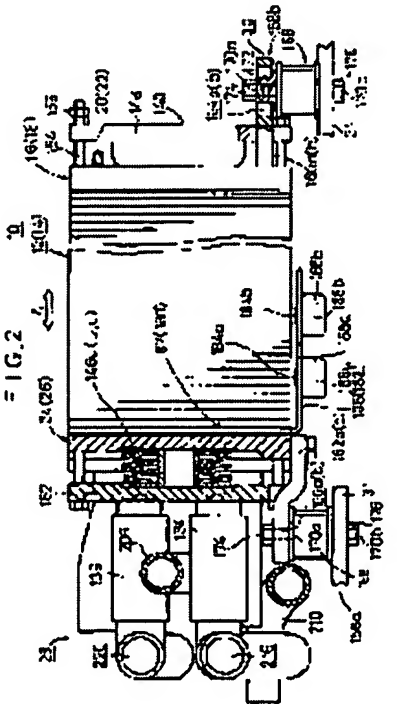

FIG.2

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* NOTICES *

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MEANS

[Means for Solving the Problem] In the fuel cell stack concerning claim 1 of this invention, a unit fuel cell cel meets horizontally, since each end plate arranged in the direction both-ends side of a laminating is held through a rubber mount at a car while a laminating is carried out, the height direction of said fuel cell stack can be short-length-ized effectively, and this fuel cell stack can be easily attached to various cars.
[0010] Furthermore, while the fixed support means which holds one [said] end-plate side on a car through a rubber mount is prepared in one end plate, the movable support means which holds the end-plate side of said another side movable in the direction of a laminating to said car through a rubber mount is prepared in the end plate of another side.
[0011] Thereby, in case said fuel cell stack expands and contracts in the direction of a laminating by change of the ambient temperature of a fuel cell stack, or an operating temperature etc., the end plate of another side moves in the direction of a laminating under an operation of a movable support means, and stress does not occur in mounting structure. Therefore, it becomes possible for the leakage of fuel gas, oxidant gas, etc. not to arise from the laminating part of a fuel cell stack, and to maintain the generation-of-electrical-energy engine performance highly with an easy configuration.
[0012] Moreover, in the fuel cell stack concerning claim 2 of this invention, while a fixed support means and a movable support means are equipped with the supporter formed at a time in two lower both-ends sides of each end plate, a rubber mount is equipped with said movable support means, and it has the movable color member along with the long picture long hole in the direction of a laminating of said supporter. Thereby, while the configuration of the whole mounting structure is simplified and it is economical, it can respond smoothly through a color member to the telescopic motion to the direction of a laminating of a fuel cell stack.
[0013] By the fuel cell stack concerning claim 3 of this invention, the fixed support means which holds one end-plate side on a car, and the movable support means which holds the end-plate side of another side movable in the direction of a laminating to said car are established further again. Therefore, in case said fuel cell stack expands and contracts in the direction of a laminating by change of the ambient temperature of a fuel cell stack, or an operating temperature etc., the end plate of another side moves in the direction of a laminating under an operation of a movable support means, and stress does not occur in mounting structure.
[0014] And in the fixed support means, while the back up plate is fixed to the mounting bracket fixed to a car side, it has prevented that one end plate estranges from said back up plate through specification-part material more than predetermined spacing. Thereby, even if vibration etc. occurs in a fuel cell stack, also when one end plate does not estrange greatly beyond the need from the back up plate and one [said] end plate is equipped with accessory vessels, such as a manifold, the conclusion section or the seal section of said accessory vessel are not influenced.
[0015]
[Embodiment of the Invention] Drawing 1 is the outline strabism explanatory view of the fuel cell system 10 by which the fuel cell stack concerning the 1st operation gestalt of this invention is

incorporated, and drawing 2 is the side-face explanatory view of said fuel cell system 10.
[0016] The fuel cell system 10 is equipped with the 1st fuel cell stack 12 and the 2nd fuel cell stack 14 which are mutually arranged in parallel along a horizontal direction (the direction of arrow-head A). The 2nd power ejection terminal 22 which is the 1st power ejection terminal 20 and negative electrode which are a positive electrode is formed in the 1st end plate 16 and 18 which constitutes the end section vertical plane by the side of the same of the 1st and 2nd fuel cell stacks 12 and 14.
[0017] The piping device 28 for performing supply and discharge of fuel gas, oxidant gas, and a cooling medium to said 1st and 2nd fuel cell stacks 12 and 14 is included in 2nd end-plate [which is the other end vertical plane by the side of the same of the 1st and 2nd fuel cell stacks 12 and 14] 24, and 26 side. The 1st and 2nd fuel cell stacks 12 and 14 are fixed to the installation plate 31 which constitutes a car through the mounting device 30.
[0018] The 1st fuel cell stack 12 is equipped with the 1st and 2nd separators 34 and 36 which pinch the unit fuel cell cel 32 and this unit fuel cell cel 32 as shown in drawing 3 and drawing 4 ; and the laminating of two or more sets of these is carried out horizontally (the direction of arrow-head A). The direction of a long side (the direction of arrow-head C) directs horizontally, and the 1st fuel cell stack 12 is arranged while it has the shape of a rectangular parallelepiped as a whole and the direction of a shorter side (the direction of arrow-head B) directs in the gravity direction.
[0019] While the unit fuel cell cel 32 has the solid-state polyelectrolyte film 38, and the cathode lateral electrode 40 and the anode lateral electrode 42 arranged on both sides of this electrolyte membrane 38, the 1st and 2nd gaseous diffusion layers 44 and 46 which consist of porosity carbon paper which is a porous layer are arranged by said cathode lateral electrode 40 and said anode lateral electrode 42.
[0020] On both sides of the unit fuel cell cel 32, the 1st and 2nd gaskets 48 and 50 are formed, and while said 1st gasket 48 has the big opening 52 for containing the cathode lateral electrode 40 and the 1st gaseous diffusion layer 44, it has the big opening 54 for said 2nd gasket 50 to contain the anode lateral electrode 42 and the 2nd gaseous diffusion layer 46. The unit fuel cell cel 32 and the 1st and 2nd gaskets 48 and 50 are pinched with the 1st and 2nd separators 34 and 36.
[0021] Shorter side 55b directs in the gravity direction, and the 1st separator 34 is arranged while field 34a which counters the cathode lateral electrode 40, and field 34b of the opposite side are set up in the shape of a rectangle, for example, long side 55a directs horizontally.
[0022] Oxidant gas inlet-port 56a for passing the oxidant gas which is oxygen content gas or air, and fuel gas inlet-port 58a for passing fuel gas, such as hydrogen content gas, have a long configuration, and are prepared in the vertical direction at the both-ends edge upper part side by the side of shorter side 55b of the 1st separator 34. It has a long configuration in the vertical direction, and oxidant gas outlet 56b and fuel gas outlet 58b are prepared in it at the both-ends edge lower part side by the side of shorter side 55b of the 1st separator 34 so that it may become oxidant gas inlet-port 56a and fuel gas inlet-port 58a in a diagonal location.
[0023] While four long picture cooling-medium inlet ports 60a-60d are formed in the direction of arrow-head C at the lower limit section of long side 55a of the 1st separator 34, four cooling-medium outlets [long picture / the direction of arrow-head C] 60e-60h are similarly established in the upper part by the side of long side 55a of this 1st separator 34. Cooling media, such as pure water, ethylene glycol, and oil, are supplied to the cooling-medium inlet ports 60a-60d. The ten 1st oxidant gas passage slots 62 which are open for free passage to oxidant gas inlet-port 56a and which became independent, respectively are established in field 34a of the 1st separator 34 toward the gravity direction, moving in a zigzag direction horizontally. The 1st oxidant gas passage slot 62 joins the five 2nd oxidant gas passage slots 63, and said 2nd oxidant gas passage slot 63 opens it for free passage to oxidant gas outlet 56b. The pore 63 for tie rod insertion is formed in the 1st separator 34 at six places.
[0024] The 2nd separator 36 is formed in the shape of a rectangle. To the both-ends edge upper part side by the side of shorter side 64b of this 2nd separator 36 While penetration formation of oxidant gas inlet-port 66a and the fuel gas inlet-port 68a is carried out, penetration formation of oxidant gas outlet 66b and the fuel gas outlet 68b is carried out at the both-ends edge lower part side so that it may become said oxidant gas inlet-port 66a and said fuel gas inlet-port 68a, and a diagonal location.

[0025] Penetration formation of the four cooling-medium inlet ports [long picture / the direction of arrow-head C] 70a-70d is carried out at the lower part by the side of long side 64a of the 2nd separator 36, and penetration formation of the cooling-medium outlets 70e-70h is similarly carried out in the direction of arrow-head C at a long picture at the upper part by the side of this long side 64a.
[0026] As shown in drawing 5 , it is open for free passage to fuel gas inlet-port 68a, and ten fuel gas passage slots 72 are formed in field 36a of the 2nd separator 36. This 1st fuel gas passage slot 72 joins the five 2nd fuel gas passage slots 73, and said 2nd fuel gas passage slot 73 is open for free passage to fuel gas outlet 68b.
[0027] As shown in drawing 6 , with field 36a of the 2nd separator 36, the cooling-medium passage 74a-74d which is open for free passage according to an individual, respectively is established in the cooling-medium inlet ports 70a-70d and the cooling-medium outlets 70e-70h toward the gravity direction at field 36b of the opposite side. Between said 1st passage slot 76a and 76b, the two 2nd passage slots 78 estrange mutually the cooling-medium passage 74a-74d predetermined spacing every in parallel with the gravity direction, and it is prepared, respectively while it is equipped with the 1st passage slots 76a and 76b of nine each which is open for free passage to the cooling-medium inlet ports 70a-70d and the cooling-medium outlets 70e-70h. The pore 63 for tie rod insertion is formed in six places like [the 2nd separator 36] the 1st separator 34.
[0028] As shown in drawing 7 , the terminal assembly 80 and the 1st electric conduction plate 82 which are a terminal plate are arranged in the direction both ends of a laminating of the unit fuel cell cel 32 to which the laminating only of the predetermined number was carried out. While the laminating of the 1st end plate 16 is carried out to a terminal assembly 80 through an electric insulating plate 84, this terminal assembly 80 is equipped with the 1st power ejection terminal 20.
[0029] As shown in drawing 8 , the 1st power ejection terminal 20 provides the minor diameter thread parts 88a and 88b in the both ends of the cylinder-like major diameter 86. The nut member 92 is screwed on by a projection and said thread-part 88a in oxidant gas inlet-port 56a of the 1st separator 34 through the pore 90 by which this thread-part 88a was formed in the terminal assembly 80. In order to raise the seal nature between terminal assemblies 80 in the shoulder of a major diameter 86, while the seal member 94 is infixed in it, an insulating ring 98 is infixed between the periphery of said major diameter 86, and the pore 96 formed in the 1st end plate 16.
[0030] As shown in drawing 9 , the 1st electric conduction plate 82 is mostly set up the same configuration, the shape of i.e., a rectangle, with the 2nd separator 36, and oxidant gas inlet-port 100a, fuel gas inlet-port 102a and oxidant gas outlet 100b, and fuel gas outlet 102b are mutually prepared in the both-ends edge by the side of a shorter side in the diagonal location. While four cooling-medium inlet ports 104a-104d and cooling-medium outlets 104e-104h are established in the long side side lower part and the upper part of the 1st electric conduction plate 82, respectively, the pore 63 for tie rod insertion is formed in six places.
[0031] the 1st electric conduction plate 82 -- the 1st fuel cell stack 12 bottom -- and 1st connection Itabe 106 who approaches the 2nd fuel cell stack 14 and extends is formed. It projects in 1st connection Itabe 106 caudad, the two bolt sections 108a and 108b are prepared for him, and these bolt sections 108a and 108b and the 1st electric conduction plate 82 consist of ingredients which have conductivity, for example, SUS, copper, etc. As shown in drawing 7 , the laminating of the 2nd end plate 24 is carried out to the 1st electric conduction plate 82 through an electric insulating plate 110, a cover plate 112, and the seal member 114.
[0032] As shown in drawing 10 and drawing 11 , the 2nd end plate 24 is constituted in the shape of a rectangle. To the both-ends edge upper part side by the side of the shorter side While penetration formation of oxidant gas inlet-port 120a and the fuel gas inlet-port 122a is carried out, to the both-ends edge lower part side by the side of the shorter side It is prepared so that oxidant gas outlet 120b and fuel gas outlet 122b may become said oxidant gas inlet-port 120a and said fuel gas inlet-port 122a, and a diagonal location.
[0033] It is a long picture horizontally, and the 1st cooling-medium passage slots 124a-124d which are open for free passage at the cooling-medium inlet ports 70a-70d of the 2nd separator 36, and the 2nd

cooling-medium passage slots 124e-124h which are open for free passage to the cooling-medium outlets 70e-70h of said 2nd separator 36 have the predetermined depth in field 24a inside the 2nd end plate 24, and are formed in it. The 1st cooling-medium passage slots 124a-124d are open for free passage at the 12 edges of 1st slot 126a, respectively. After 1st slot 126a extends up in parallel mutually, two join at a time, respectively, 2nd slot 126b is prepared, every two of said 2nd slot 126b join 3rd slot 126c, respectively, and it opens it for free passage to the cooling-medium feed hopper 128.

[0034] The 2nd cooling-medium passage slots 124e-124h are open for free passage to 12 1st slot 130a similarly, respectively, and said 1st slot 130a extends in vertical down, and they join 2nd slot 130b two [at a time]. 2nd slot 130b joins 3rd slot 130c two [at a time], and is open for free passage to the cooling-medium exhaust port 132. As shown in drawing 10 , the supply line 134 and the exhaust pipe way 136 are connected with the cooling-medium feed hopper 128 and the cooling-medium exhaust port 132, and this supply line 134 and this exhaust pipe way 136 have projected only predetermined die length to the way outside the 1st fuel cell stack 12 at them. The pore 63 for tie rod insertion is formed in the 2nd end plate 24 at six places.

[0035] As shown in drawing 7 , through the bolting device 140, the 1st fuel cell stack 12 is bound tight in the direction of a laminating (the direction of arrow-head A) in one, and is fixed to it. The bolting device 140 is formed in the external surface, liquid chamber [which is prepared in the external surface side of the 1st end plate 16] 142, and incompressible liquid 144 for planar pressure grant enclosed in this liquid chamber 142, for example, silicone oil, side of the 2nd end plate 24, and in order to press said 2nd end plate 24 to said 1st end-plate 16 side, it is equipped with three disk springs 146a-146c which estrange predetermined spacing every horizontally and are arranged.

[0036] The 1st end plate 16 is countered on both sides of the liquid chamber 142, the back up plate 148 is arranged, and the liquid chamber 142 is constituted between the sheet metal 150 of this back up plate 148, aluminum, or stainless steel. Disk springs 146a-146c are supported by the adapter plate 152 while estranging them abbreviation regular intervals every and arranging them in the field of the 2nd end plate 24. The 1st fuel cell stack 12 is penetrated from an adapter plate 152, and six tie rods (clamping bolt) 154 are inserted in the back up plate 148. By thrusting a nut 156 into the edge of a tie rod 154, the 1st fuel cell stack 12 is held in one.

[0037] As shown in drawing 2 and drawing 12 , the mounting structure 30 is equipped with movable support means 158b which holds the 1st end-plate 16 side arranged in the fixed support means 158a [which holds the 2nd end-plate 24 side arranged in the direction (direction of arrow-head A) end side of a laminating of the 1st fuel cell stack 12 on the installation plate 31 of a car], and direction other end side of a laminating of said 1st fuel cell stack 12 movable in said direction of a laminating to said installation plate 31. Fixed support means 158a and movable support means 158b are equipped with the MAWANTO brackets (supporter) 162a and 162b by which a stop is ****ed and carried out to the bracket sections [which are prepared in the lower part side of the 1st end plate 16 in one] (supporter)a [160] and 160b, and lower part side of the 2nd end plate 24. While the long picture long holes 164a and 164b are formed in the direction of a laminating of the 1st fuel cell stack 12 (the direction of arrow-head A) at the bracket sections 160a and 160b, Pores 166a and 166b are formed in mounting brackets 162a and 162b.

[0038] The rubber mounting 168 is arranged at long holes 164a and 164b and Pores 166a and 166b, respectively. A nut 174 is screwed in this thread-part 170a, while the color member 172 is arranged at said thread-part 170a to which thread parts 170a and 170b are formed up and down, and the rubber mounting 168 projects in the upper part and this color member 172 is inserted in long holes 164a and 164b from here. In the mounting bracket 162a and 162b side, thread-part 170a of the rubber mounting 168 is inserted in Pores 166a and 166b, and a nut 174 is screwed in the point. Thread-part 170b which projects in the lower part side of the rubber mounting 168 fixes the 1st fuel cell stack 12 to a car etc. by being inserted in the installation plate 31 and screwing a nut 176.

[0039] As shown in drawing 13 , while the 2nd fuel cell stack 14 is constituted symmetrically [the 1st fuel cell stack 12 mentioned above], the cathode lateral electrode 40 and the anode lateral electrode 42 are arranged to the electrolyte membrane 38 at the reverse side, and the 2nd power ejection terminal 22

which is a negative electrode is formed in the 1st end-plate 18 side (refer to drawing 14). The 2nd fuel cell stack 14 is fundamentally constituted like the 1st fuel cell stack 12, gives the same reference mark to the same component, and omits the detailed explanation.

[0040] As shown in drawing 15 , the 2nd fuel cell stack 14 has formed 2nd connection Itabe 182 close to 1st connection Itabe 106 of the 1st electric conduction plate 82 which is equipped with the 2nd electric conduction plate 180, and extends on this 2nd electric conduction plate 180 at said 2nd fuel cell stack 14 bottom, and is prepared in the 1st fuel cell stack 12. The bolt sections 108a and 108b of a pair, and 184a and 184b are prepared for 1st and 2nd connection Itabe 106 and 182, respectively.

[0041] The flexible connection object 186a and 186b, for example, stranded wires, is connected to the bolt sections 108a and 184a and the bolt sections 108b and 184b, respectively. Stranded wires 186a and 186b are constituted by twisting the lead wire of the shape of much thin line reticulated, and are covered with the rubber coverings 188a and 188b, respectively.

[0042] As shown in drawing 13 , it is arranged in the location where fuel gas inlet-port 122a and oxidant gas outlet 120b approach mutually the 2nd end plate 24 and 26 which constitutes the 1st and 2nd fuel cell stacks 12 and 14, respectively, and the piping device 28 is included in this 2nd end plate 24 and 26.

[0043] As shown in drawing 1 and drawing 16 , the piping device 28 is equipped with the 1st bracket 190 which covers each fuel gas inlet-port 122a of the 2nd end plate 24 and 26 which constitutes the 1st and 2nd fuel cell stacks 12 and 14 installed mutually, and is fixed to said 2nd end plate 24 and 26 in one. The fuel gas supply pipes 192a and 192b which are open for free passage, respectively are formed in each fuel gas inlet-port 122a, said fuel gas supply pipes 192a and 192b join this 1st bracket 190, and it is open for free passage to the fuel gas feed hopper 194.

[0044] Each oxidizing agent gas outlet 120b is covered to the 2nd end plate 24 and 26, and the 2nd bracket 196 is fixed to it. The point of the oxidant gas exhaust pipes 198a and 198b which are formed in this 2nd bracket 196 and are open for free passage to oxidant gas outlet 120b, respectively is open for free passage in one to the oxidant gas exhaust port 200.

[0045] Each oxidizing agent gas inlet 120a and fuel gas outlet 122b are covered to the 2nd end plate 24 and 26, and the 3rd and 4th brackets 202 and 204 are fixed to it. While the both ends of the oxidant gas supply pipe 206 which is open for free passage to oxidant gas inlet-port 120a are open for free passage to the 3rd and 4th brackets 202 and 204, the oxidant gas feed hopper 208 is formed in the way of this oxidant gas supply pipe 206. To the 3rd and 4th brackets 202 and 204, the both ends of the fuel gas exhaust pipe 210 which is open for free passage to fuel gas outlet 122b are open for free passage, and the fuel gas exhaust port 212 is formed in the way of this fuel gas exhaust pipe 210.

[0046] The both ends of the cooling-medium supply pipe 214 are connected with each supply line 134 established in the 2nd end plate 24 and 26, and the cooling-medium feed hopper 216 is formed in this cooling-medium supply pipe 214. While the cooling-medium exhaust pipe 218 is connected with each exhaust pipe way 136 established in the 2nd end plate 24 and 26, the cooling-medium exhaust port 220 is formed in this cooling-medium exhaust pipe 218.

[0047] Thus, actuation of the fuel cell system 10 constituted is explained below.

[0048] As shown in drawing 1 , while fuel gas (for example, gas containing the hydrogen which reformed the hydrocarbon) is supplied to the fuel cell system 10 from the fuel gas feed hopper 194, air or oxygen content gas (only henceforth air) is supplied to the oxidant gas feed hopper 208 as oxidant gas. Furthermore, a cooling medium is supplied to the cooling-medium feed hopper 216.

[0049] The fuel gas supplied to the fuel gas feed hopper 194 is sent to each fuel gas inlet-port 122a of the 2nd end plate 24 and 26 which constitutes the 1st and 2nd fuel cell stacks 12 and 14 through the fuel gas supply pipes 192a and 192b, and is further introduced into the 1st fuel gas passage slot 72 from each fuel gas inlet-port 68a of the 2nd separator 36. As shown in drawing 5 , the fuel gas supplied to the 1st fuel gas passage slot 72 moves in the gravity direction, moving in a zigzag direction horizontally along with field 36a of the 2nd separator 36.

[0050] The hydrogen gas in fuel gas is supplied to the anode lateral electrode 42 of the unit fuel cell cel 32 through the 2nd gaseous diffusion layer 46 in that case. And while intact fuel gas moves along the 1st fuel gas passage slot 72 and the anode lateral electrode 42 is supplied, intact fuel gas is discharged from

fuel gas outlet 68b through the 2nd fuel gas passage slot 73. This intact fuel gas is introduced into the fuel gas exhaust pipe 210 through each fuel gas outlet 122b of the 2nd end plate 24 and 26, and is discharged from the fuel cell system 10 through the fuel gas exhaust port 212.

[0051] On the other hand, the air supplied to the oxidant gas feed hopper 208 is sent to each oxidant gas inlet-port 120a prepared in the 2nd end plate 24 and 26 through the oxidant gas supply pipe 206, and oxidant gas inlet-port 56a of the 1st and 2nd fuel cell stack 12 and the 1st separator 34 incorporated in 14 is supplied further (refer to drawing 3). With the 1st separator 34, the air supplied to oxidant gas inlet-port 56a is introduced into the 1st oxidant gas passage slot 62 in field 34a, and it moves in the gravity direction, moving in a zigzag direction horizontally along this 1st oxidant gas passage slot 62.

[0052] While the oxygen gas in air is supplied to the cathode lateral electrode 40 from the 1st gaseous diffusion layer 44 in that case, intact air is discharged from oxidant gas outlet 56b through the 2nd oxidant gas passage slot 63. The air discharged by this oxidant gas outlet 56b is discharged from the oxidant gas exhaust port 200 through the oxidant gas exhaust pipes 198a and 198b from oxidant gas outlet 120b prepared in the 2nd end plate 24 and 26 (refer to drawing 1).

[0053] By this, a generation of electrical energy will be performed by the 1st and 2nd fuel cell stacks 12 and 14, and power will be supplied to the 1st and 2nd power ejection terminal 20 with which properties differ, respectively and the load connected among 22, for example, the motor which is not illustrated.

[0054] Moreover, the inside of the 1st and 2nd fuel cell stack 12 and 14 is effectively cooled by the cooling medium. That is, the cooling medium supplied to the cooling-medium feed hopper 216 is introduced into the supply line 134 established in the 2nd end plate 24 and 26 from the cooling-medium supply pipe 214. As shown in drawing 11 , this cooling medium is introduced into the cooling-medium feed hopper 128 of the 2nd end plate 24 and 26, and is sent to the 1st cooling-medium passage slots 124a-124d through 1st slot 126a from two or more 2nd slot 126b.

[0055] The cooling medium introduced into the 1st cooling-medium passage slots 124a-124d is introduced into the cooling-medium inlet ports 70a-70d formed in the lower part side of the 2nd separator 36, and as shown in drawing 6 , it moves toward the upper part in the cooling-medium passage 74a-74d which is open for free passage at said cooling-medium inlet ports 70a-70d from a lower part. The cooling medium which cooled each unit fuel cell cel 32 through the cooling-medium passage 74a-74d is introduced into the 2nd cooling-medium passage slots 124e-124h of the 2nd end plate 24 and 26 through the cooling-medium outlets 70e-70h (refer to drawing 11). The cooling medium introduced into these 2nd cooling-medium passage slots 124e-124h is sent to the cooling-medium exhaust port 132 through 1st slot 130a to 2nd slot 130b, and is discharged from the cooling-medium exhaust port 220 through the cooling-medium exhaust pipe 218 from the exhaust pipe way 136.

[0056] In this case, with the 1st operation gestalt, while the 1st and 2nd fuel cell stacks 12 and 14 are arranged in parallel with the direction of a laminating (the direction of arrow-head A), respectively, it is fixed to the installation plate 31 of a car through the mounting structure 30 (refer to drawing 2 and drawing 12). For this reason, it becomes possible for the mounting structure 30 not to project in the upper part side of the 1st and 2nd fuel cell stacks 12 and 14, and to utilize effectively the tooth space by the side of this upper part. Therefore, in case especially the fuel cell system 10 is carried in a car, this fuel cell system 10 can be easily held in an under floor etc., and the effectiveness that the degree of freedom of a layout improves is acquired.

[0057] Furthermore, the mounting structure 30 is equipped with movable support means 158b, and the rubber mounting 168 was equipped with it with the bracket sections 160a and 160b to which this movable support means 158b has the long picture long holes 164a and 164b in the direction of arrow-head A, and it is equipped with the movable color member 172 along with said long holes 164a and 164b.

[0058] For this reason, in case the thermal expansion and the heat shrink of laminating components cause and said 1st and 2nd fuel cell stacks 12 and 14 expand and contract in the direction of a laminating by change of the ambient temperature and the operating temperature of the 1st and 2nd fuel cell stacks 12 and 14 etc., the 1st end plate 16 and 18 is movable in the direction of arrow-head A through long holes 164a and 164b. Therefore, while stress does not act on the mounting structure 30 at the time of

contraction of the 1st and 2nd fuel cell stacks 12 and 14 and preventing damage on said mounting structure 30, it becomes possible to prevent certainly the leakage of the fuel gas from said 1st and 2nd fuel cell stacks 12 and 14, oxidant gas, or a cooling medium.

[0059] And the mounting structure 30 was substantially formed in the 1st end plate 16 in one, and is equipped with the bracket sections 160a and 160b in which long holes 164a and 164b were formed, and the mounting brackets 162a and 162b by which a stop is ****ed and carried out to the 2nd end plate 24. Thereby, the configuration of this mounting structure 30 whole is simplified effectively, and the advantage of being very economical is acquired.

[0060] In addition, although the 1st and 2nd fuel cell stacks 12 and 14 are arranged in parallel and the fuel cell system 10 is constituted from the 1st operation gestalt, when using only the 1st fuel cell stack 12, the same effectiveness is acquired, for example.

[0061] Drawing 17 is the outline strabism explanatory view of the fuel cell stack 240 concerning the 2nd operation gestalt of this invention.

[0062] 2nd end-plate 24a is arranged and, as for this fuel cell stack 240, the piping device 28 is included in this 2nd end-plate 24a side. The fuel cell stack 240 is equipped with the mounting structure 242, and this mounting structure 242 is equipped with movable support means 158b which holds the 1st end-plate 16a side arranged in the fixed support means [which holds the 2nd end-plate 24a side arranged in the direction end side of a laminating of the fuel cell stack 240 to a car] 244, and direction other end side of a laminating of said fuel cell stack 240 movable in said direction of a laminating to a car. In addition, the same reference mark is given to the same component as the 1st fuel cell stack 12 concerning the 1st operation gestalt, and the detailed explanation is omitted.

[0063] As shown in drawing 17 thru/or drawing 19 , the fixed support means 244 While being fixed to the mounting bracket 246 fixed to the installation plate 31 by the side of a car, and said mounting bracket 246 The back up plate 248 with which the tie rod (clamping bolt) 154 which binds the fuel cell stack 240 tight in the direction of a laminating engages, It is prepared in 1st end-plate 16a and said back up plate 248 in one, and has the specification-part material 250 which prevents what (arrow-head A1 direction) this 1st end-plate 16a estranges from this back up plate 248 more than predetermined spacing, for example, a maintenance bolt.

[0064] A mounting bracket 246 is equipped with the level installation section 254 fixed to the installation plate 31 by the side of a car through a bolt 252, and the vertical installation section 258 which fixes the back up plate 248 through a bolt 256, and said vertical installation section 258 avoids the piping device 28, and is arranged at the abbreviation central part of said back up plate 248.

[0065] As shown in drawing 18 , while plurality 260, for example, two screw-thread holes, is formed in the abbreviation center section of 2nd end-plate 24a, corresponding to said screw-thread hole 260, the stepped hole section 262 is formed in the back up plate 248. The maintenance bolt 250 has a clearance in extent to which the rod section 268 prepared between the head 266 and said thread part 264 can slide on the minor diameter side of the stepped hole section 262, and is inserted in it while it ****s the thread part 264 prepared at the tip and thrusts it into a hole 260. By engaging with the outside section of the back up plate 248, the head 266 of the maintenance bolt 250 secures predetermined spacing between 2nd end-plate 24a and said back up plate 248, and prevents that said 2nd end-plate 24a estranges from said back up plate 248 more than this spacing.

[0066] As shown in drawing 19 , while oxidant gas inlet-port 120a and fuel gas inlet-port 122a are prepared in a longitudinal direction both-ends edge upper part side at 2nd end-plate 24a, fuel gas outlet 122b and oxidant gas outlet 120b are prepared in the longitudinal direction both-ends edge lower part side. Cooling-medium inlet-port 270a and every two cooling-medium outlet 270b are formed in the long side side lower part and the upper part of 2nd separator 24a, respectively.

[0067] As shown in drawing 17 and drawing 18 , while a total of six washer plates 276 are horizontally arranged in two trains, between 2nd end-plate 24a and the back up plate 248, a total of six disk springs 278 are horizontally arranged in the 1st end-plate 16a side in two trains so that each core may carry out abbreviation coincidence in the core and the direction of arrow-head A of said washer plate 276.

[0068] Thus, in the fuel cell stack 240 constituted, the fixed support means 244 which constitutes the

mounting structure 242 is equipped with the mounting bracket 246 prepared in the fuel cell stack 240, and the back up plate 248 fixed to this mounting bracket 246. For this reason, it is not necessary to adopt the movable structure as a cure against thermal expansion as a back-up-plate 248 side like the 1st end-plate 16a side, and is effective in the degree of freedom of the installation location of a mounting bracket 246 increasing. Since the piping device 28 is included in the four directions by the side of the back up plate 248 in that case, the vertical installation section 258 which constitutes a mounting bracket 246 is easily attached in the abbreviation center section of said back up plate 248 so that it may not interfere in this piping device 28.

[0069] Furthermore, with the 2nd operation gestalt, while a mounting bracket 246 is fixed to the installation plate 31 of a car and the back up plate 248 is fixed to this mounting bracket 246 through a bolt 256, the fuel cell stack 240 is bound tight in one in the direction of a laminating (the direction of arrow-head A) with the tie rod 154 which engages with said back up plate 248. For this reason, 2nd end-plate 24a is not directly fixed to a mounting bracket 246, but the uniform bolting force is certainly given to the fuel cell stack 240 whole through a disk spring 278 and the washer plate 276.

[0070] And 2nd end-plate 24a is held through the maintenance bolt 250 at the back up plate 248. The rod section 268 is inserted free [sliding] into the stepped hole section 262 of the back up plate 248, and while a head 266 engages with the outside section of said back up plate 248, the thread part 264 is screwing this maintenance bolt 250 in the screw-thread hole 260 of 2nd end-plate 24a. Even if it follows, for example, vibration occurs in the fuel cell stack 240 like [at the time of a light impact], 2nd end-plate 24a does not move in the direction estranged from the back up plate 248 greatly.

[0071] It becomes possible in that case to prevent certainly at 2nd end-plate 24a about accessory vessels (not shown), such as reactant gas and a manifold for cooling media, being concluded, and this 2nd end-plate 24a vibrating greatly in the arrow-head A1 direction, and having a bad influence on the conclusion section and the seal section of said accessory vessel.

[0072] In the piping device 28, a disk spring 278 is located in the opposite side, and is arranged further again at the 1st end-plate 16a side. Thereby, interference with the piping device 28 is avoided and the effectiveness that the design degree of freedom of a disk spring 278 improves is acquired.

[Translation done.]